

**REMARKS****Introduction**

A petition for a two-month extension of time accompanies this response together with the appropriate fee. Accordingly, the deadline for responding to the Office Action has been extended until November 24, 2009, and this response is therefore timely filed.

***Status of claims***

Claims 1 to 12 are pending in the application.

Claims 1 to 11 have been rejected.

Claims 1, 4, and 7 have been currently amended.

Claim 1 has been amended by incorporating the condition that a mass fraction of at least 10 % of the monomers C is an olefinically unsaturated acid from original claim 4. This condition has been deleted from claim 4 and replaced by the enumeration of acid monomers C taken from page 3, lines 7 to 12 of the specification.

It is deemed that no new matter has been added by such amendments. It is also deemed that no further search or consideration will be necessitated by these amendments, and entry thereof is therefore respectfully requested.

**The Office Action*****Rejection under 35 U. S. C. § 103 (a)***

Claims 1 to 11 have been rejected under 35 U. S. C. § 103 (a) over the Journal Article by Sandip Desai et al, International Journal of Polymer Materials, Vol. 53, Issue 12, pages 106 to 1070, entitled "Bond Strength Improvement of

Polyurethane Adhesive by Grafting 2-Hydroxyethyl Methacrylate on Polyol Backbone" ("Desai"), in view of the Gilles et al CH 679 310 A5 ("Gilles").

It is noted that this article has not been published before December 2004. See the attached abstract which has been downloaded from the website of the publisher, where this publication date is mentioned.

As the international filing date of this instant application was August 20, 2004, which is before the publication date of this cited article, it is deemed that this article is not prior art under 35 USC §102.

Desai discloses a reaction product made from an epoxy resin with a fatty acid, where the oxirane ring is opened, and a hydroxy ester is formed in the place of the epoxy group, or oxirane ring, to the extent that there are carboxylic acid groups in the fatty acid added. The epoxy ester polyol thus formed is grafted with hydroxyethyl methacrylate. This reaction leads to consumption of the olefinic double bonds, and to an increase of the number of hydroxyl groups. Crosslinking is finally effected by adding a difunctional isocyanate, TDI (toluylene diisocyanate).

Contrary to Desai, in the present invention, an ester of an epoxy resin and a fatty acid is prepared (identical to the first step in Desai), but then the epoxy ester is grafted with a mixture of olefinically unsaturated monomers which do not all contribute to the number of hydroxyl groups, as in Desai. The major difference lies in the following step, where in the present invention, the grafted epoxy ester is reacted with both a isocyanate-functional and olefinically unsaturated reaction product of a hydroxy-functional olefinically unsaturated acrylic monomer and a difunctional

isocyanate, thereby introducing olefinic unsaturation in the molecule, and at the same time, reducing the number of hydroxyl groups.

There is also no teaching, suggestion or motivation to introduce additional acid groups into the polymer by grafting, preferably in an amount corresponding to an acid number of from 5 mg/g to 80 mg/g, as per claim 10.

The subject matter of the present invention is therefore not rendered obvious by Desai, even if it was prior art which it is not.

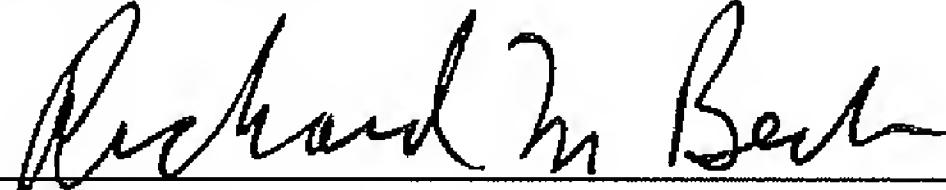
Gilles describes a two-step reaction where in the first step, a semi-blocked isocyanate is formed by reaction of one molecule of a diisocyanate with a hydroxy functional acrylate, to form a semi-blocked isocyanate which is reacted in the second step with a hydroxy functional fatty acid.

The step of grafting an ester of an epoxy resin with a fatty acid with a mixture of olefinically unsaturated monomers to obtain an epoxy ester with an increased acid number which is then water-soluble, is neither mentioned nor suggested in either of Desai or Gilles. This step which allows to adapt the acid number of the resulting product **ABCDE** of the present invention to provide a water-dilutable resin, which water-dilutable resin is neither mentioned nor suggested by Desai or Gilles. It is deemed that the subject matter of the present invention is neither shown nor suggested by Desai or Gilles taken alone or in combination with one another.

***Conclusion***

It is therefore deemed that the claims as amended are allowable, and the application is in good standing for allowance or appeal. Entry of the amendments, and favorable reconsideration are respectfully requested.

Respectfully submitted,

  
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# BOND STRENGTH IMPROVEMENT OF POLYURETHANE ADHESIVE BY GRAFTING 2-HYDROXYETHYL METHACRYLATE ON POLYOL BACKBONE

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## Abstract

A series of acrylated polyols were prepared by grafting 2-hydroxyethyl methacrylate (HEMA) on to polyol backbone prepared from vegetable oil fatty acid and epoxy resin. Grafting was carried out by free radical mechanism on conjugated double bond present in the polyol using benzoyl peroxide (BPO) as an initiator. Polyols and polyurethane adhesives were characterized by IR spectroscopy. Polyurethane adhesive synthesized from the modified polyols were found to provide better peel strength to styrene butadiene rubber (SBR) joints. Mode of failure was studied using Scanning Electron Microscopy (SEM). Improvement in cohesive strength of the adhesives resulted in high bonding strength. Comparative study has been carried out to determine the effect of acylation on polyurethane adhesive by Green strength, Curing behavior, and Chemical resistance studies. Loading of 20% HEMA gave significant results. However, 15% loading of HEMA resulted in a sample with highest peel strength.

Keywords: acrylated polyol; two-pack polyurethane adhesive; peel strength

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